DECLARATION

I, the undersigned, Kiyoshi SUMIKAWA, c/o NEC Patent Service Ltd., of Goyou-Shibaura Building, 5-11, Shibaura 4-chome, Minato-ku, Tokyo, Japan, do hereby solemnly and sincerely declare that I am familiar with the English and Japanese languages, that I have prepared the attached English translation which is a full, true and faithful one of the patent application filed with the Patent Office of Japan under the Application No. 214597/2002 and that the present declaration is intended for use in connection with a patent application placed before the United States Patent and Trademark Office.

I further declare that all statements made herein in my own knowledge and belief are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issuing thereon.

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[Title of the Invention]
Color Adjusting Method Used for Projector

[Claims for the Patent]
[Claim 1]

A color adjusting method used for a projector that projects an image corresponding to a video signal on a screen or wall to adjust a color of the image displayed on the screen or wall if a color of said screen or wall is different from white, the method being characterized by comprising:

an area dividing process of dividing all or part of a display area in said screen or wall into two areas;

a white light projecting process of installing, on one of said areas in said screen or wall, a standard image plate on which a standard image displayed in a correct color when said projector projects white light is drawn and causing said projector to project said white light on said standard image plate;

a corrected image projecting process of projecting, on the other of said areas in said screen or wall, a corrected image emitted by said projector and having the same pattern as that of said standard image drawn on said standard image plate;

a correction data creating process of creating correction data used to correct said video signal so that said corrected image is closer to said standard image; and

a color adjusting process of adjusting a color of said corrected image displayed on said screen or wall by adding said correction data to said video signal.

[Claim 2]

The color adjusting method used for a projector according to Claim 1, characterized in that said correction data creating process comprises at least one of a white adjusting process of paying attention to white parts of said corrected image and standard image to make adjustment so that a color of the white part of said corrected image is closer to a color of the white part of said standard image, a color balance adjusting process of paying attention to a color balance of the entire corrected image and the entire standard image to make adjustment so that the color balance of said corrected image is closer to the color balance of said standard image, or a specific color adjusting process of paying attention to specific color parts of said corrected image and standard image to make adjustment so that a color of the specific color part of said corrected image is closer to a color of the specific color part of said standard image.

[Claim 3]

The color adjusting method used for a projector according to Claim 1 or 2, characterized in that the image drawn on said standard image plate contains all of white, red, green, blue, and the specific color used in said correction data creating process.

[Claim 4]

A color adjusting method used for a projector that projects an image corresponding to a video signal on a screen or wall to adjust a color of the image displayed on the screen or wall if a color of said screen or wall is different from white, the method being characterized by comprising:

an area dividing process of dividing all or part of a display area in said screen or wall into two areas;

a standard image projecting process of installing, on one of said areas in said screen or wall, a standard white plate on which a standard image is displayed in a correct color when the standard image is projected by said projector and causing said projector to project said standard image on said standard white plate;

a corrected image projecting process of projecting, on the other of said areas in said screen or wall, a corrected image emitted by said projector and having the same pattern as that of said standard image drawn on said standard white plate;

a correction data creating process of creating correction data used to correct said video signal so that said corrected image is closer to said standard image; and

a color adjusting process of adjusting a color of the image displayed on said screen or wall by adding said correction data to said video signal.

[Claim 5]

The color adjusting method used for a projector according to Claim 4, characterized in that said correction

data creating process comprises at least one of a white adjusting process of paying attention to white parts of said corrected image and standard image to make adjustment so that a color of the white part of said corrected image is closer to a color of the white part of said standard image, a color balance adjusting process of paying attention to a color balance of the entire corrected image and the entire standard image to make adjustment so that the color balance of said corrected image is closer to the color balance of said standard image, or a specific color adjusting process of paying attention to specific color parts of said corrected image and standard image to make adjustment so that a color of the specific color part of said corrected image is closer to a color of the specific color part of said standard image. [Claim 6]

A color adjusting method used for a projector that projects an image corresponding to a video signal on a screen or wall to adjust a color of the image displayed on the screen or wall if a color of said screen or wall is different from white, the method being characterized by comprising:

an area dividing process of dividing a display area in said screen or wall into two areas;

a standard image projecting process of installing, on one of said areas in said screen or wall, a standard white plate on which a standard image is displayed in a correct color when the standard image is projected by said projector and causing said projector to project said standard image on said standard white plate;

a corrected image projecting process of projecting, on the other of said areas in said screen or wall, a corrected image emitted by said projector and having the same pattern as that of said standard image drawn on said standard white plate;

a correction data creating process of creating correction data used to correct said video signal so that said corrected image is closer to said standard image; and

a color adjusting process of adjusting a color of the image displayed on said screen or wall by adding said correction data to said video signal.

[Claim 7]

The color adjusting method used for a projector according to Claim 6, characterized in that said correction data creating process comprises at least one of a white adjusting process of paying attention to white parts of said corrected image and standard image to make adjustment so that a color of the white part of said standard image is closer to a color of the white part of said corrected image, a color balance adjusting process of paying attention to a color balance of the entire corrected image and the entire standard image to make adjustment so that the color balance of said standard image is closer to the color balance of said corrected image, or a specific color adjusting process of paying attention to specific color parts of said corrected image and standard image to make adjustment so that a color of the specific color part of said standard image is closer to a color of the specific color part of said corrected image.

[Claim 8]

The color adjusting method used for a projector according to Claim 4, 5, 6, or 7, characterized in that said standard image contains all of white, red, green, blue, and the specific color used for said correction data creating process.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to a color adjusting method for a projector, and in particular, to a color adjusting method suitably used if the color of a screen or wall on which an image is projected is different from white.

[0002]

[Prior Art]

An image projected by a projector such as a liquid crystal projector is displayed on a screen or wall. However, such a screen or wall is not necessarily so white as it is when it starts to be used: it may become yellowish or bluish. If an image is projected on such a screen or wall, it is displayed in colors relatively different from actual ones. Consequently, a user does not see the displayed image in its original colors. Therefore, the colors of the projected image must be adjusted.

[0003]

In the prior art, a color adjusting method used for a projector of this kind is implemented, for example, as shown

in Figure 18. A projector 10 is combined with a screen 20. A user M observes a projected image 30 on the screen 20. On the basis of the results of the observation, the user operates the projector 10.

[0004]

Figure 19 is a block diagram showing an electrical configuration of the projector 10 in Figure 18.

The projector 10 is composed of an operating section 11, a color correction processing section 12, an output signal processing section 13, and a video output section 14 as shown in Figure 19. The operating section 11 includes key switches and the like and is operated on the basis of the user M's determinations. On the basis of the user M's operation of the operating section 11, the color correction processing section 12 generates correction data d used to correct an externally supplied video signal in. The output signal processing section 13 adds the correction data d to the video signal in to generate a color-adjusted video signal P. The video output section 14 is, for example, a three-plate type liquid crystal projector unit that splits white light generated by a light source into primary lights in red (R), green (G), and blue (B). The video output section 14 then modulates the primary lights in accordance with the video signal P. Subsequently, the video output section 14 carries out additive color mixture and then projects the mixed light on the screen 20.

[0005]

With the color adjusting method used for the projector 10, if the color of the screen 20 is different from white, the user M first observes the color of the projected image 30. On the basis of the results of the observation, the user operates the operating section 11 to carry out white balance adjustment, color temperature adjustment, and color corrections (adjustment of luminance, hue, or saturation) so that the image assumes desired colors.

[0006]

[Problems to be Solved by the Invention]

However, this conventional color adjusting method used for the projector has the problems described below.

Specifically, with the conventional color adjusting method, the user M observes the colors of the projected image 30 and subjectively adjusts them on the basis of the results of the observation. Thus, the colors are adjusted without using any accurate references. Therefore, the user M disadvantageously cannot adjust the colors accurately.

[0007]

The present invention is provided in view of the above circumstances. It is an object of the present invention to provide a color adjusting method used for a projector and which allows a user to execute color adjustments easily even if the color of the screen or wall is different from white.

[0008]

[Means for Solving the Problems]

To accomplish the above object, according to claim 1, there is provided a color adjusting method used for a projector that projects an image corresponding to a video signal on a screen or wall to adjust a color of the image displayed on the screen or wall if a color of the screen or wall is different from white, the method being characterized by comprising an area dividing process of dividing all or part of a display area in the screen or wall into two areas, a white light projecting process of installing, on one of the areas in the screen or wall, a standard image plate on which a standard image displayed in a correct color when the projector projects white light is drawn and causing the projector to project the white light on the standard image plate, a corrected image projecting process of projecting, on the other of the areas in the screen or wall, a corrected image emitted by the projector and having the same pattern as that of the standard image drawn on the standard image plate, a correction data creating process of creating correction data used to correct the video signal so that the corrected image is closer to the standard image, and a color adjusting process of adjusting a color of the corrected image displayed on the screen or wall by adding the correction data to the video signal.

[0009]

According to Claim 2, the color adjusting method used for a projector according to Claim 1 is characterized in that the correction data creating process comprises at least one of a white adjusting process of paying attention to white

parts of the corrected image and standard image to make adjustment so that a color of the white part of the corrected image is closer to a color of the white part of the standard image, a color balance adjusting process of paying attention to a color balance of the entire corrected image and the entire standard image to make adjustment so that the color balance of the corrected image is closer to the color balance of the standard image, or a specific color adjusting process of paying attention to specific color parts of the corrected image and standard image to make adjustment so that a color of the specific color part of the corrected image is closer to a color of the specific color part of the standard image.

[0010]

According to Claim 3, the color adjusting method used for a projector according to Claim 1 or 2 is characterized in that the image drawn on the standard image plate contains all of white, red, green, blue, and the specific color used in the correction data creating process.

[0011]

According to Claim 4, there is provided a color adjusting method used for a projector that projects an image corresponding to a video signal on a screen or wall to adjust a color of the image displayed on the screen or wall if a color of the screen or wall is different from white, the method being characterized by comprising an area dividing process of dividing all or part of a display area in the screen or wall into two areas, a standard image projecting process of installing, on one of the areas in the screen or wall, a

standard white plate on which a standard image is displayed in a correct color when the standard image is projected by the projector and causing the projector to project the standard image on the standard white plate, a corrected image projecting process of projecting, on the other of the areas in the screen or wall, a corrected image emitted by the projector and having the same pattern as that of the standard image drawn on the standard white plate, a correction data creating process of creating correction data used to correct the video signal so that the corrected image is closer to the standard image, and a color adjusting process of adjusting a color of the image displayed on the screen or wall by adding the correction data to the video signal.

[0012]

According to Claim 5, the color adjusting method used for a projector according to Claim 4 is characterized in that the correction data creating process comprises at least one of a white adjusting process of paying attention to white parts of the corrected image and standard image to make adjustment so that a color of the white part of the corrected image is closer to a color of the white part of the standard image, a color balance adjusting process of paying attention to a color balance of the entire corrected image and the entire standard image to make adjustment so that the color balance of the corrected image is closer to the color balance of the standard image, or a specific color adjusting process of paying attention to specific color parts of the corrected image and standard image to make adjustment so that a color

of the specific color part of the corrected image is closer to a color of the specific color part of the standard image.

[0013]

According to Claim 6, there is provided a color adjusting method used for a projector that projects an image corresponding to a video signal on a screen or wall to adjust a color of the image displayed on the screen or wall if a color of the screen or wall is different from white, the method being characterized by comprising an area dividing process of dividing a display area in the screen or wall into two areas, a standard image projecting process of installing, on one of the areas in the screen or wall, a standard white plate on which a standard image is displayed in a correct color when the standard image is projected by the projector and causing the projector to project the standard image on the standard white plate, a corrected image projecting process of projecting, on the other of the areas in the screen or wall, a corrected image emitted by the projector and having the same pattern as that of the standard image drawn on the standard white plate, a correction data creating process of creating correction data used to correct the video signal so that the corrected image is closer to the standard image, and a color adjusting process of adjusting a color of the image displayed on the screen or wall by adding the correction data to the video signal.

[0014]

According to Claim 7, the color adjusting method used for a projector according to Claim 6 is characterized in that

the correction data creating process comprises at least one of a white adjusting process of paying attention to white parts of the corrected image and standard image to make adjustment so that a color of the white part of the standard image is closer to a color of the white part of the corrected image, a color balance adjusting process of paying attention to a color balance of the entire corrected image and the entire standard image to make adjustment so that the color balance of the standard image is closer to the color balance of the corrected image, or a specific color adjusting process of paying attention to specific color parts of the corrected image and standard image to make adjustment so that a color of the specific color part of the standard image is closer to a color of the specific color part of the corrected image.

[0015]

According to Claim 8, the color adjusting method used for a projector according to Claim 4, 5, 6, or 7 is characterized in that the standard image contains all of white, red, green, blue, and the specific color used for the correction data creating process.

[0016]

[Embodiment]

Embodiments of the present invention are described below with reference to the drawings.

Figure 1 is a view showing a projector used to implement a color adjusting method as a first embodiment of the present invention, as well as the surrounding environment of the projector.

As shown in Figure 1, the color adjusting method of this aspect is executed by combining a projector 40, a screen 50, and a standard image plate 60. The projector 40 projects an image corresponding to a provided video signal, on the screen 50. In particular, in this embodiment, white light is projected on one of two vertical or horizontal areas in the display area of the screen 50. An image is projected on the other area.

[0017]

The screen 50, which was white when it started to be used, has become yellowish or bluish owing to, for example, secular changes. The standard image plate 60 is installed in an area J of the screen 50. A standard image is drawn on the standard image plate 60 and is displayed in its correct colors when the projector 40 projects white light on it through a standard white area W. The standard image contains all of, for example, white, red, green, blue, and a memory color (for example, flesh color, plant green, or sky blue). The projector 40 projects a corrected image in an area K of the screen 50 through a corrected image projecting area C, the corrected image having the same pattern as that of the standard image drawn on the standard image plate 60. The user observes the standard image on the area J and the corrected image on the area K of the screen 50. On the basis of the results of the observation, the user operates the projector 40 so that the corrected image has the same colors as those of the standard image.

[0018]

Figure 2 is a block diagram showing an electrical configuration of the projector 40 in Figure 1.

As shown in Figure 2, the projector 40 is composed of an internal image generating section 41, an image switching section 42, an operating section 43, a color correction processing section 44, an image division processing section 45, and a video output section 70. The internal image processing section 41 holds, as an internal image, a corrected image projected on the area K of the screen 50. In particular, in this embodiment, the internal image generating section 41 generates a corrected image having the same pattern as that of the standard image drawn on the standard image plate 60. That image switching section 42 selectively switches the image held by the internal image generating section 41 as an internal image or a video signal in corresponding to the user's favorite image, on the basis of the user's operation. The operating section 43 is composed of key switches and the like and is operated on the basis of the user's determinations.

[0019]

The color correction processing section 44 generates correction data d on the basis of an operation performed on the operating section 43 by the user, the correction data d being used to correct the image selected by the internal image generating section 41. The image division processing section 45 adds the correction data d to the image selected by the image switching section 42, to generate a color-

adjusted corrected image and thus a video signal P. The video signal P divides the display area of the screen 50 into the two horizontally arranged areas J and K. The video signal P projects the corrected image in the area K while projecting white light in the area J (standard image plate 60). The video output section 70 is composed of, for example, a three-plate type liquid crystal projector unit. The video output section 70 splits white light generated by a light source into primary lights in red, green, and blue. The video output section 70 then modulates each primary light in accordance with the video signal P outputted by the screen division processing section 45. The video output section 70 finally executes additive color mixture to mix the lights and projects the mixed light on the screen 20.

[0020]

Figure 3 is a view showing an example of a configuration of the video output section 70.

As shown in Figure 3, the video output section 70 is composed of a three-plate type liquid crystal projector unit including a lamp 71, a reflector 72, an interference filter 73, a dichroic mirrors 74 and 75, mirrors 76, 77, and 78, liquid crystal light valves 79, 7A, and 7B, a dichroic prism 7C, and a projection lens 7D.

[0021]

The video output section 70 uses the dichroic mirror 74 and 75 to split white light generated by the lamp 71 into primary lights in red, green, and blue. The video output section 70 then modulates each primary light in accordance

with the video signal P (the light is transmitted or blocked by the liquid crystal light vales 79, 7A, and 7B). Then, the dichroic prism 7C mixes the lights and the projection lens 7D projects the mixed light on the screen 50.

[0022]

Figure 4 is a view showing an example of the standard image on the standard image plate 60 and the corrected image in the area K of the screen 50. Figure 5 is a flow chart illustrating a color adjusting method used for the projector 40 in Figure 2.

With reference to Figures 4 and 5, description will be given of the contents of processing executed in the color adjusting method used in this embodiment.

As shown in Figure 4, the image division processing section 45 divides the display area of the screen 50 into the two horizontally arranged areas J and K (step A1, area dividing process). The standard image plate 60 is installed on the area J of the screen 50. The video output section 70 projects white light on the standard image plate 60 from the projector 40 (step A2, white light processing process). Further, the video output section 70 projects a corrected image on the area K of the screen 50, the corrected image having the same pattern as that of the standard image drawn on the standard image plate 60 from the projector 40 (step A3, corrected image projecting process).

[0023]

The user operates the operating section 43 on the basis of his or her determinations. The color correction

processing section 44 creates correction data d to correct the video signal in so that the corrected image on the area K is closer to the standard image on the standard image plate 60 (step A4, corrected data creating process). This corrected data creating process (step A4) comprises at least one of a white adjusting process (step A4a), a color balance adjusting process (step A4b), and a specific color adjusting process (step A4c).

[0024]

The white adjusting process (step A4a) comprises paying attention to white parts of the corrected and standard images to make adjustment so that the luminance of the white part of the corrected image is closer to that of the standard image. The color balance adjusting process (step A4b) comprises paying attention to the color balance of the entire corrected and standard images to make adjustment so that the color balance of the corrected image is closer to that of the standard image. In this case, at least one of the luminance, hue, and saturation of red, green, and blue in the corrected image is adjusted. The specific color adjusting process (step A4c) comprises paying attention to a specific color (for example, a memory color such as flesh color or sky blue) part of each of the corrected and standard images to make adjustment so that the color of the specific color part of the corrected image is closer to that of the standard image. The correction data d is added to the video signal in to adjust the colors of the corrected image displayed on the screen 50 (step A5, color adjusting process). Subsequently, the

division of the display area of the screen 50 is cleared. An image corresponding to the color adjusted video signal in is displayed on the screen 50.

[0025]

As described above, in the first embodiment, the standard image plate 60 is installed in the area J of the screen 50. Then, the standard image on the standard image plate 60 is used as a reference to adjust the color of the corrected image on the area K of the screen 50. Consequently, even if the color of the screen 50 is different from white, the user can adjust the colors of the video signal in by operating the operating section 43 and executing a simple process.

[0026]

Second Embodiment

Figure 6 is a view showing a projector used to implement a color adjusting method as a second embodiment of the present invention, as well as the surrounding environment of the projector. The same elements as those in Figure 1, showing the first embodiment, are denoted by common reference numerals.

As shown in Figure 6, the color adjusting method of this aspect is executed by combining a projector 40A configured differently from the projector 40 in Figure 1, the screen 50, and a standard white plate 80 that replaces the standard image plate 60. The projector 40A projects an image corresponding to a given video signal, on the screen 50 but

also projects separate images on two vertical or horizontal areas in the display area of the screen 50.

[0027]

When the projector 40A projects a standard image on the standard white plate 80 through a standard image projecting area R, the standard image is displayed on the standard white plate 80 in the correct colors. The standard image contains all of, for example, white, red, green, blue, and a memory color (for example, flesh color, plant green, or sky blue). The projector 40A projects a corrected image in the area K of the screen 50 through the corrected image projecting area C, the corrected image having the same pattern as that of the standard image drawn on the standard white plate 80. The user observes the standard image on the area J and the corrected image on the area K of the screen 50. On the basis of the results of the observation, the user operates the projector 40A so that the corrected image has the same colors as those of the standard image.

[0028]

Figure 7 is a block diagram showing an electrical configuration of the projector 40A in Figure 6. The same elements as those in Figure 2, showing the first embodiment, are denoted by common reference numerals.

As shown in Figure 7, instead of the internal image generation section 41 and the screen division processing section 45, the projector 40A is provided with an internal image generating section 41A and a screen division processing section 45A configured differently from the sections 41 and

45, respectively. The internal image processing section 41A holds, as an internal image, a standard image to be projected on the standard white plate 80 as well as a corrected image to be projected on the area K of the screen 50. The image division processing section 45A adds correction data d to the image selected by the image switching section 42 to generate a color-adjusted corrected image and thus a video signal P. The video signal P divides the display area of the screen 50 into the two horizontally arranged areas J and K. The video signal P projects the corrected image in the area K while projecting the standard image in the area J of the screen 50.

[0029]

Figure 8 is a view showing an example of the standard image on the standard white plate 80 and the corrected image in the area K of the screen 50. Figure 9 is a flow chart illustrating a color adjusting method used for the projector 40A in Figure 7.

With reference to Figures 8 and 9, description will be given of the contents of processing executed in the color adjusting method used in this embodiment.

As shown in Figure 8, the image division processing section 45 divides the display area of the screen 50 into the two horizontally arranged areas J and K (step B1, area dividing process). The standard white plate 80 is installed on the area J of the screen 50. The projector 40 projects the standard image on the standard white plate 80 (step B2, standard image processing process). Further, the projector

40A projects a corrected image on the area K of the screen 50, the corrected image having the same pattern as that of the standard image projected on the standard white plate 80 (step B3, corrected image projecting process).

[0030]

The user operates the operating section 43 on the basis of his or her determinations. The color correction processing section 44 creates correction data d to correct the video signal in so that the corrected image on the area K is closer to the standard image on the standard white plate 80 (step B4, corrected data creating process).

This corrected data creating process (step B4) comprises at least one of a white adjusting process (step B4a), a color balance adjusting process (step B4b), and a specific color adjusting process (step B4c).

[0031]

The white adjusting process (step B4a) comprises paying attention to white parts of the corrected and standard images to make adjustment so that the luminance of the white part of the corrected image is closer to that of the standard image. The color balance adjusting process (step B4b) comprises paying attention to the color balance of the entire corrected and standard images to make adjustment so that the color balance of the corrected image is closer to that of the standard image. In this case, at least one of the luminance, hue, and saturation of red, green, and blue in the corrected image is adjusted. The specific color adjusting process (step B4c) comprises paying attention to a specific color

(for example, a memory color such as flesh color or sky blue) part of each of the corrected and standard images to make adjustment so that the color of the specific color part of the corrected image is closer to that of the standard image. The correction data d is added to the video signal in to adjust the colors of the corrected image displayed on the screen 50 (step B5, color adjusting process). Subsequently, the division of the display area of the screen 50 is cleared. An image corresponding to the color adjusted video signal in is displayed on the screen 50.

[0032]

As described above, in the second embodiment, the standard white plate 80 is installed in the area J of the screen 50. Then, the standard image on the standard white plate 80 is used as a reference to adjust the color of the corrected image on the area K of the screen 50. Consequently, even if the color of the screen 50 is different from white, the user can adjust the colors of the video signal in by operating the operating section 43 and executing a simple process.

[0033]

Third Embodiment

Figures 10 to 15 are views illustrating a color adjusting method as a third embodiment of the present invention.

The color adjusting method of this aspect will be described with reference to Figures 10 to 15 as well as Figures 7 to 9, showing the second embodiment.

In the color adjusting method of this aspect, as shown in Figure 10, the image division processing section 45 divides a display area of a wall 90 into the two horizontally arranged areas J and K (step B1, area dividing process). A standard white screen 50A is installed on the area J of the wall 90. The projector 40 projects the standard image on the screen 50A (step B2, standard image processing process). Further, the projector 40A projects a corrected image on the area K of the wall 90, the corrected image having the same pattern as that of the standard image projected on the screen 50A (step B3, corrected image projecting process).

[0034]

The user operates the operating section 43 on the basis of his or her determinations. The color correction processing section 44 creates correction data d to correct the video signal in so that the corrected image on the area K is closer to the standard image on the screen 50A (step B4, corrected data creating process). This corrected data creating process (step B4) comprises at least one of a white adjusting process (step B4a), a color balance adjusting process (step B4b), and a specific color adjusting process (step B4c).

[0035]

The white adjusting process (step B4a) comprises paying attention to white parts of the corrected and standard images to make adjustment so that the luminance of the white part of the corrected image is closer to that of the standard image, as shown in Figure 10. The color balance adjusting process

(step B4b) comprises paying attention to the color balance of the entire corrected and standard images to make adjustment so that the color balance of the corrected image is closer to that of the standard image, as shown in Figures 11, 12, 13, and 14. In this case, at least one of the luminance, hue, and saturation of red, green, and blue in the corrected image is adjusted. The specific color adjusting process (step B4c) comprises paying attention to a specific color (for example, a memory color such as flesh color or sky blue) part of each of the corrected and standard images to make adjustment so that the color of the specific color part of the corrected image is closer to that of the standard image, as shown in Figure 15. The correction data d is added to the video signal in to adjust the colors of the corrected image displayed on the wall 90 (step B5, color adjusting process). Subsequently, the division of the display area of the wall 90 is cleared. An image corresponding to the color adjusted video signal in is displayed on the wall 90.

[0036]

As described above, the third embodiment gives advantages similar to those of the second embodiment.

[0037]

The embodiments of the present invention have been described in detail with reference to the drawings. However, specific configurations are not limited to these embodiments. Variations made to the design without departing from the spirits of the present invention are included in the present invention.

For example, in Figures 4 and 8, the display area of the screen 50 may be divided into two vertically arranged areas. Alternatively, the positions of the standard and corrected images may be reversed. The positions and sizes of these two areas are arbitrary provided that the corrected image can be compared with the standard image. For example, only part of the display area may be used as shown in Figures 16 and 17. Further, the white adjusting process (step A4a), color balance adjusting process (step A4b), and specific color adjusting process (step A4c) in Figure 5 may be executed in an arbitrary order. Alternatively, only arbitrary one or two of these processes may be executed.

[0038]

Further, in place of the three-plate type liquid crystal projector unit, the video output section 70 in Figure 2 may be, for example, a single-plate type projector unit or a DLP (Digital Light Processing) projector. The DLP is a projection type video display method developed by Texas Instrument Incorporated, U.S. With the DLP, by controlling the directions of several million mirrors constituting an element and each having a size of 13 × 13 μm, light from a light source is reflected to project a video on the screen.

[0039]

Furthermore, in the second embodiment, in the correction data creating process (step B4), the correction data d is such that the corrected image is closer to the standard image. Moreover, in each of the embodiments, a plurality of images corrected using color correction parameters (at least one

of the luminance, hue, and saturation of red, green, and blue) may be provided so that the colors of the right and left images can be matched with each other by selecting a proper image.

Further, in the third embodiment, the standard white screen 50A is installed on the area J of the wall 90. However, in place of the screen 50A, the standard image plate 60 in Figure 1 may be installed. In this case, it is possible to execute a color adjusting method similar to that in the first embodiment. Furthermore, in the correction data creating process in Figure 5 (step A4) and the correction data creating process in Figure 9 (step B4), color adjusting scroll bars corresponding to the respective colors may be displayed in a display screen and used to adjust the luminance, hue, or saturation. Alternatively, in these correction data creating processes (steps A4 and B4), color adjusting color palettes corresponding to the respective colors may be displayed in the display screen so that a proper color can be selected from the color palette for color adjustment. [0040]

Furthermore, in each embodiment, a plurality of colors may be assumed for the screen 50, and a plurality of correction data may be created which correspond to the respective colors. Then, in the correction data creating process (steps A4 and B4), a color closest to the current one of the screen 50 may be selected. Then, the correction data corresponding to the selected color may be used. The color may be selected by using scroll bars displayed in the display screen to select the luminance, hue, or saturation or displaying color palettes

in the display screen and selecting a proper color from these color palettes.

[Advantages of the Invention]

As described above, according to the configuration of the present invention, the standard image plate is installed in one of the areas in the screen or wall, and the corrected image on the other area in the screen or wall has its color adjusted using the standard image on the standard image plate as a reference. Consequently, even if the color of the screen or wall is different from white, the colors in a video signal can be adjusted by simple processing. Alternatively, the standard white plate is installed in one of the areas in the screen or wall, and the corrected image on the other area in the screen or wall has its color adjusted using the standard image on the standard white plate as a reference. Consequently, even if the color of the screen or wall is different from white, the colors in a video signal can be adjusted by simple processing.

[Brief Description of the Drawings]

[Figure 1]

Figure 1 is a view showing a projector used to implement a color adjusting method as a first embodiment of the present invention, as well as the surrounding environment of the projector.

[Figure 2]

Figure 2 is a block diagram showing an electrical configuration of a projector 40 in Figure 1.

[Figure 3]

Figure 3 is a view showing an example of a configuration of a video output section 70 in Figure 2.

[Figure 4]

Figure 4 is a view showing an example of a standard image on a standard image plate 60 and a corrected image on an area K in a screen 50.

[Figure 5]

Figure 5 is a flow chart illustrating a color adjusting method used for the projector 40 in Figure 2.

[Figure 6]

Figure 6 is a view showing a projector used to implement a color adjusting method as a second embodiment of the present invention, as well as the surrounding environment of the projector.

[Figure 7]

Figure 7 is a block diagram showing an electrical configuration of a projector 40A in Figure 6.

[Figure 8]

Figure 8 is a view showing an example of a standard image on a standard white plate 80 and a corrected image on the area K in the screen 50.

[Figure 9]

Figure 9 is a flow chart illustrating a color adjusting method used for the projector 40A in Figure 7.

[Figure 10]

Figure 10 is a view illustrating a color adjusting method according to a third embodiment.

[Figure 11]

Figure 11 is a view illustrating the color adjusting method according to the third embodiment.

[Figure 12]

Figure 12 is a view illustrating the color adjusting method according to the third embodiment.

[Figure 13]

Figure 13 is a view illustrating the color adjusting method according to the third embodiment.

[Figure 14]

Figure 14 is a view illustrating the color adjusting method according to the third embodiment.

[Figure 15]

Figure 15 is a view illustrating the color adjusting method according to the third embodiment.

[Figure 16]

Figure 16 is a view showing a variation of the two areas.

[Figure 17]

Figure 17 is a view showing a variation of the two areas.

[Figure 18]

Figure 18 is a view showing a projector used to implement a conventional color adjusting method, as well as the surrounding environment of the projector.

[Figure 19]

Figure 19 is a block diagram showing an electrical configuration of a projector 10 in Figure 18.

[Description of Symbols]

40, 40A ... Projectors

41 ... Internal image generating section

42 ... Image switching section

43 ... Operating section

44, 41A ... Color correction processing sections

45, 45A ... Image division processing sections

50, 50A ... Screens

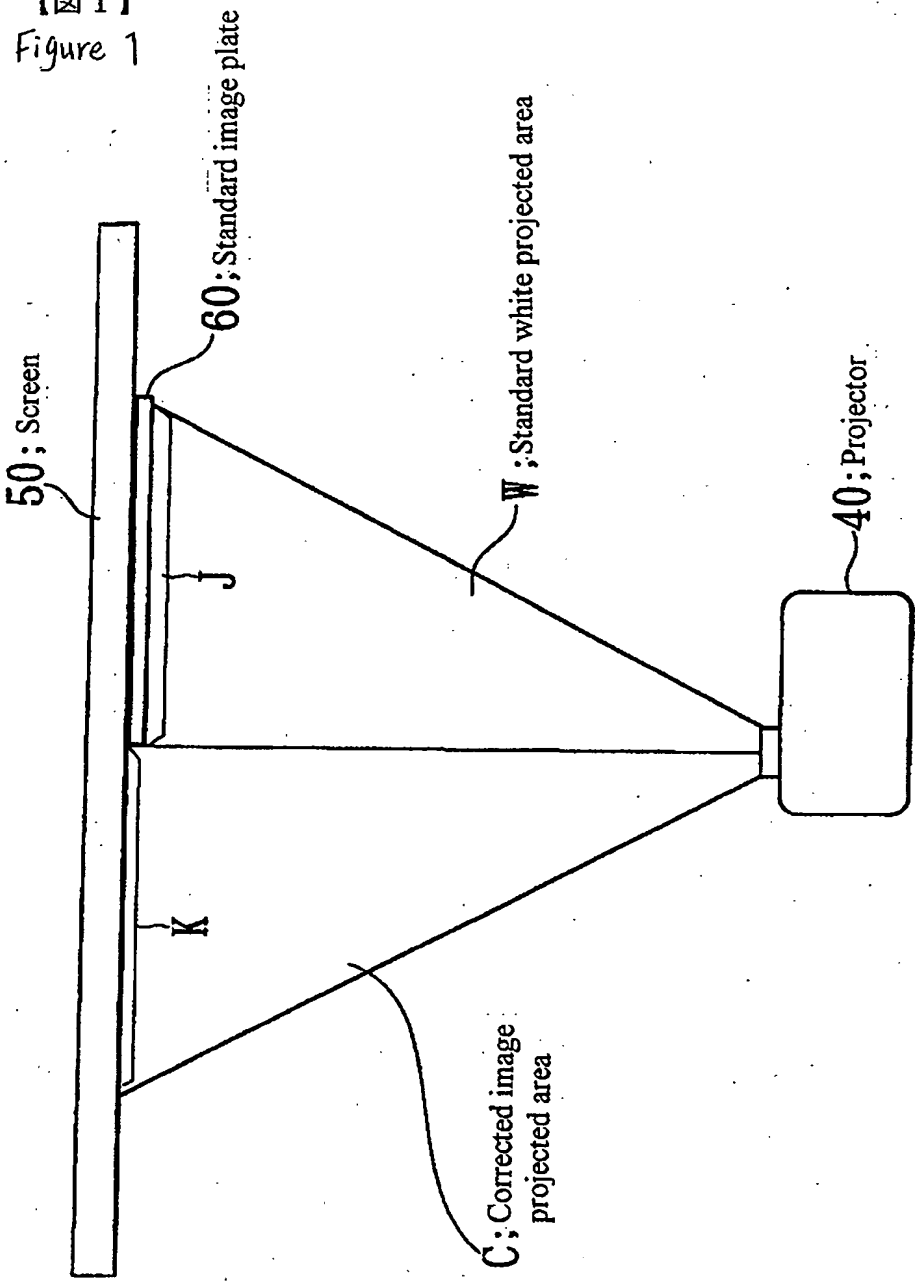
60 ... Standard image plate

70 ... Video output section

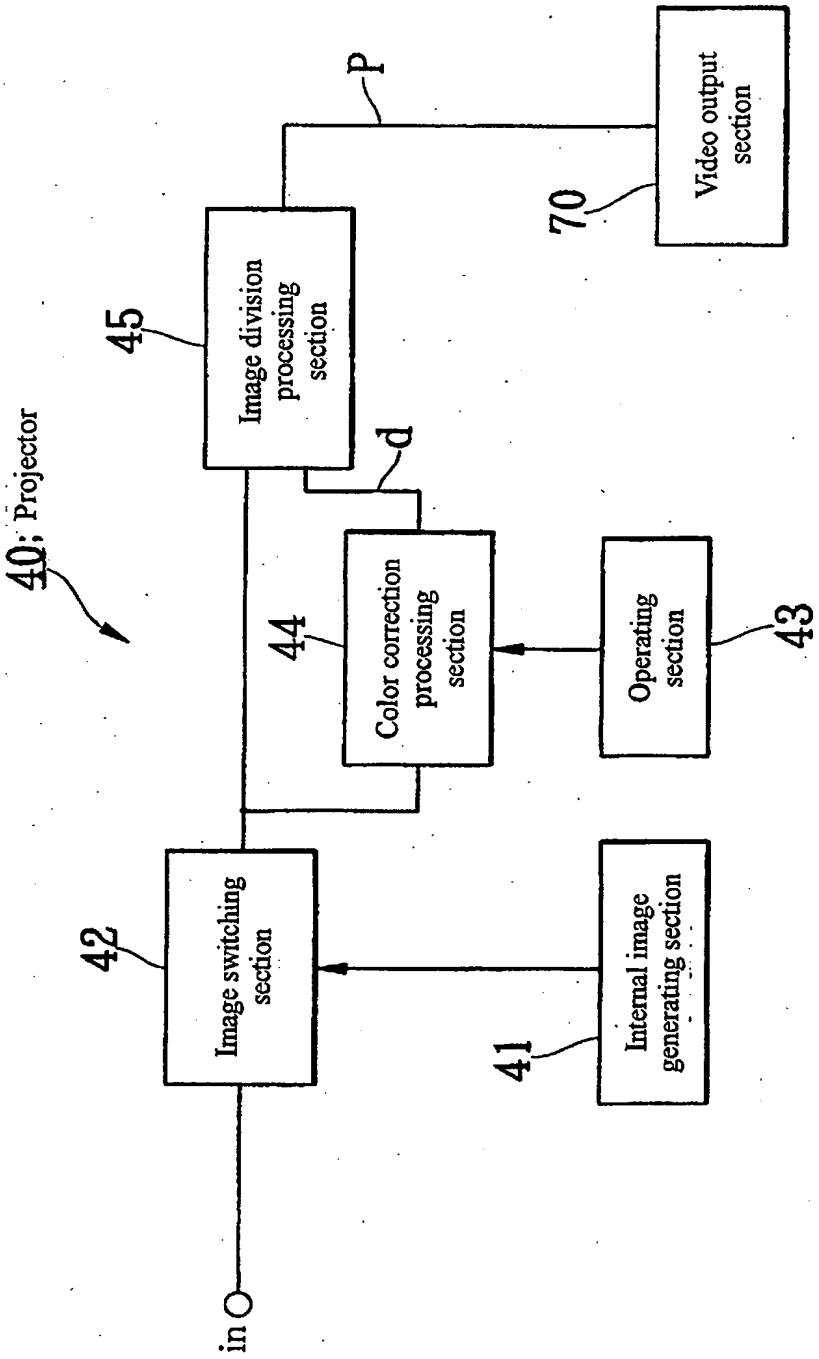
80 ... Standard white plate

90 ... Wall

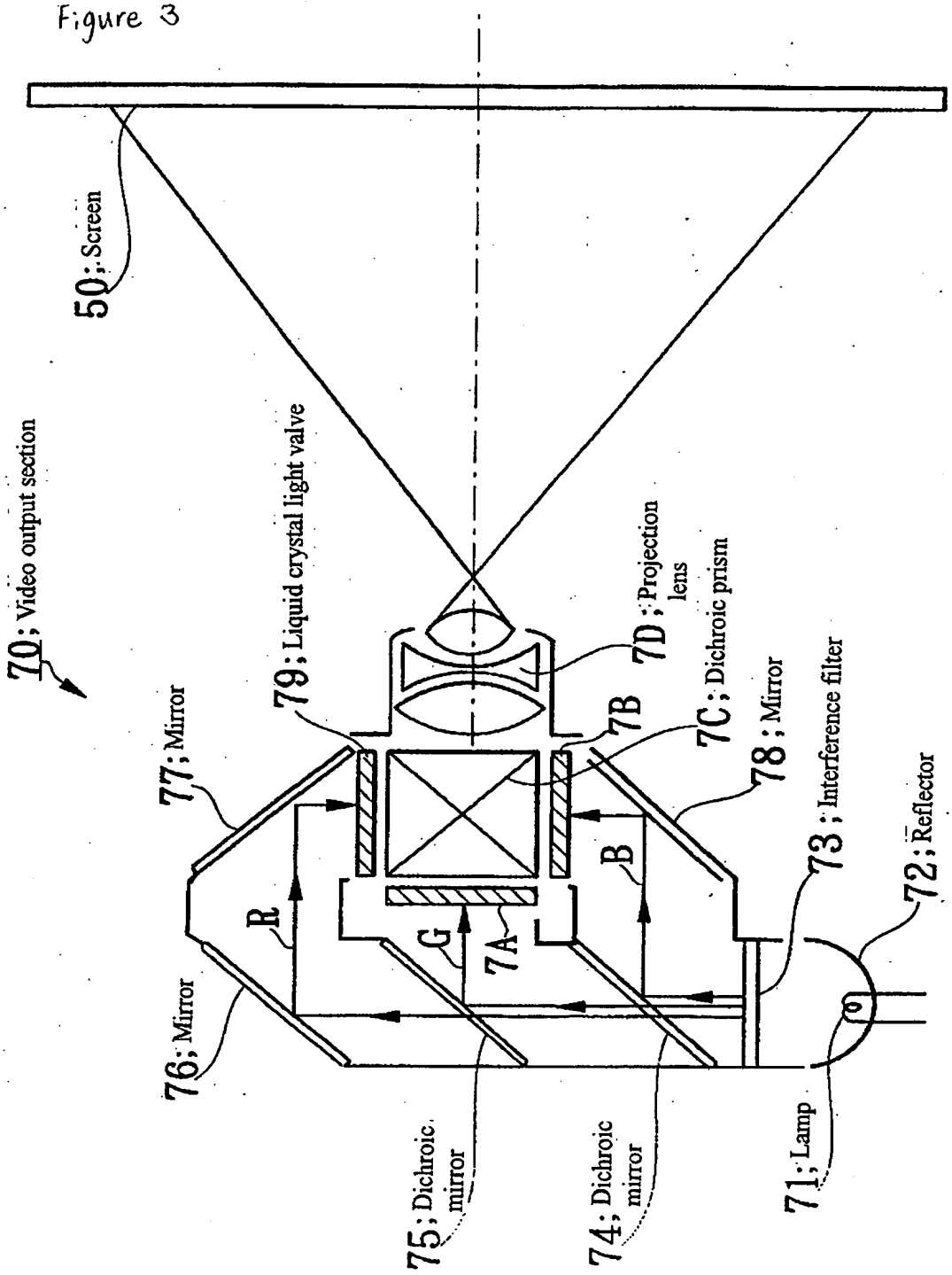
【書類名】　図面
[Title of the Document]　Drawings
【図１】
Figure 1



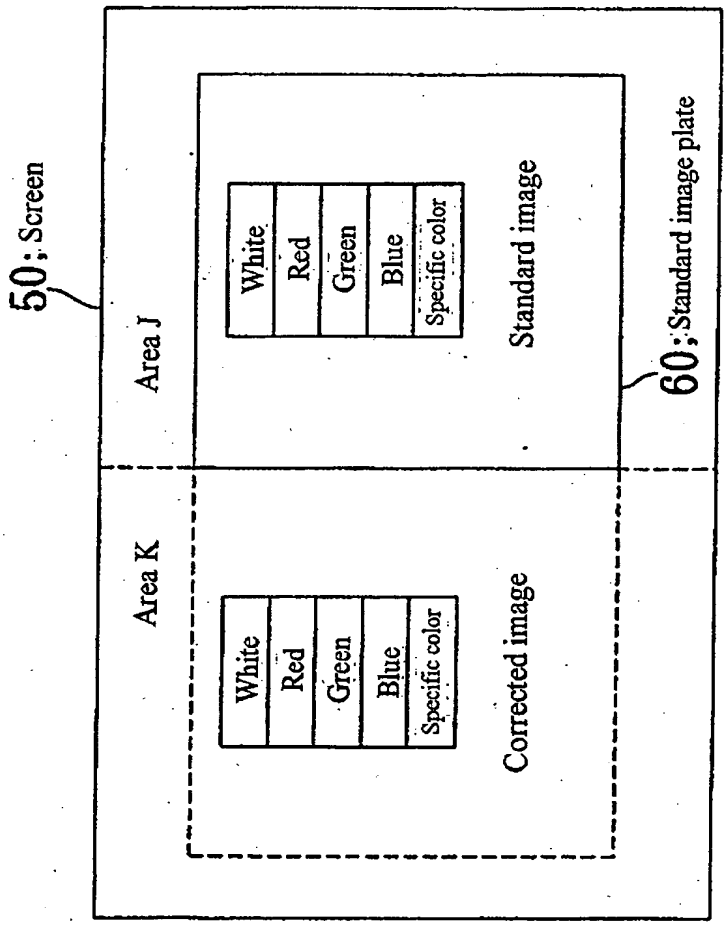
【図２】
Figure 2


40; Projector
45
Image division processing section
P
Video output section
70
d
44
Color correction processing section
Operating section
43
42
Image switching section
Internal image generating section
41
in

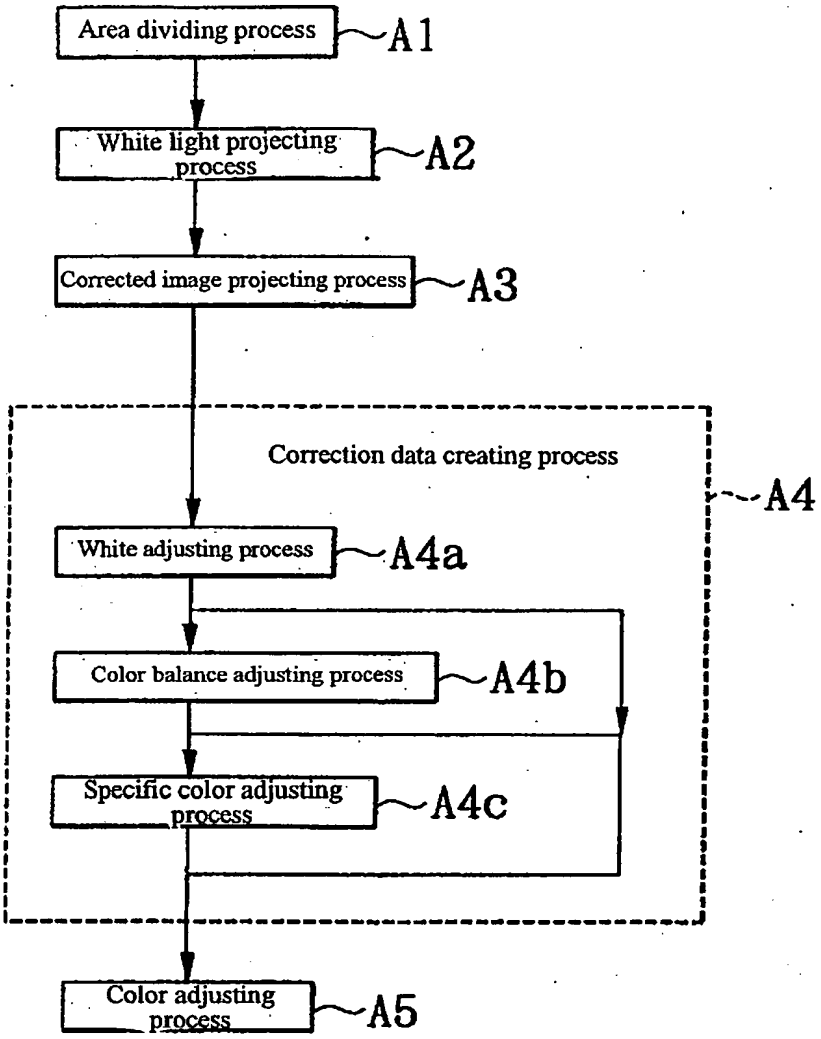
【図３】
Figure 3


50; Screen
70; Video output section
79; Liquid crystal light valve
7D; Projection lens
7C; Dichroic prism
7B
78; Mirror
77; Mirror
73; Interference filter
72; Reflector
R
G
B
7A
76; Mirror
75; Dichroic mirror
74; Dichroic mirror
71; Lamp

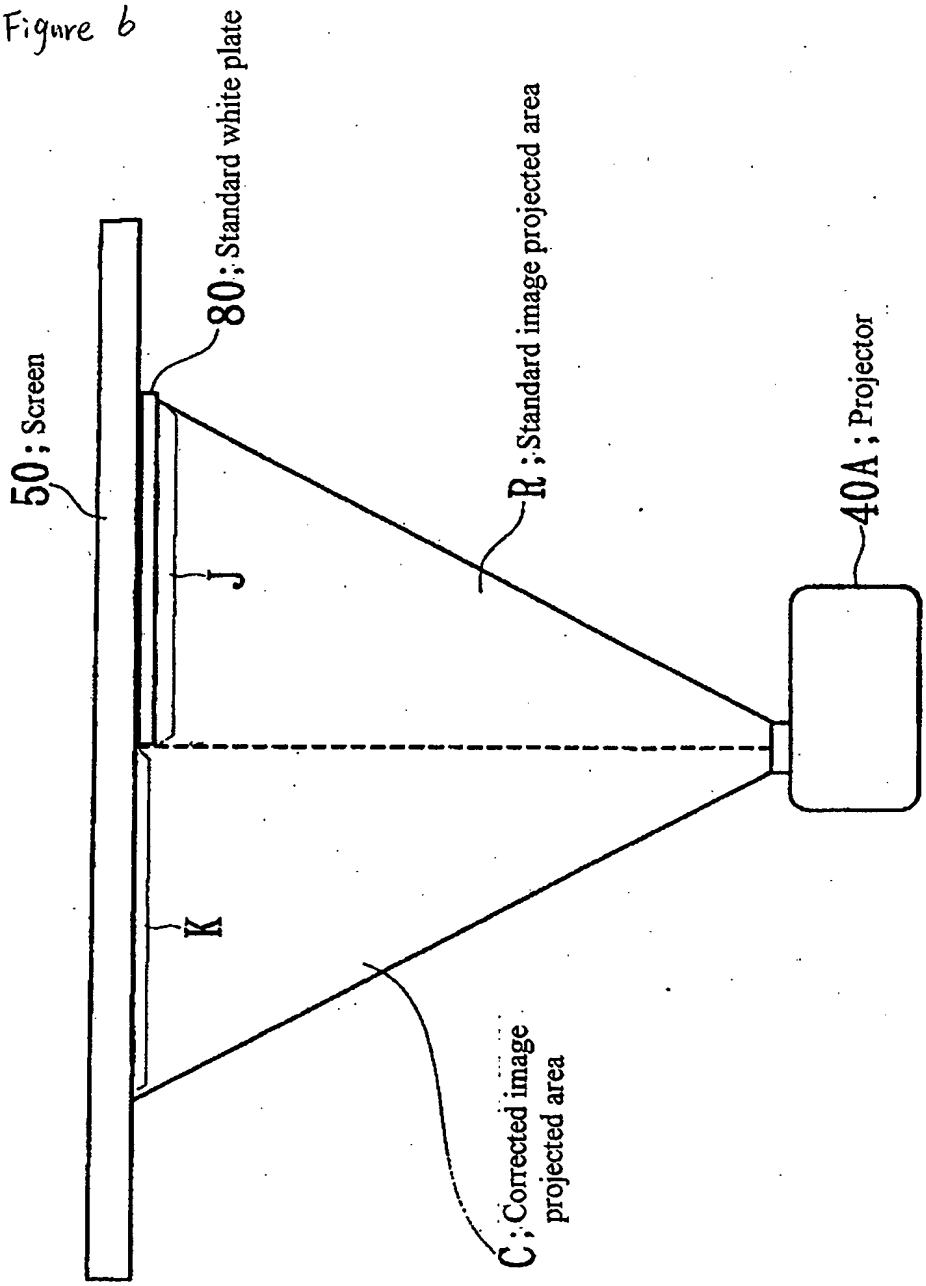
【図４】
Figure 4


50; Screen
Area J
White
Red
Green
Blue
Specific color
Standard image
60; Standard image plate
Area K
White
Red
Green
Blue
Specific color
Corrected image

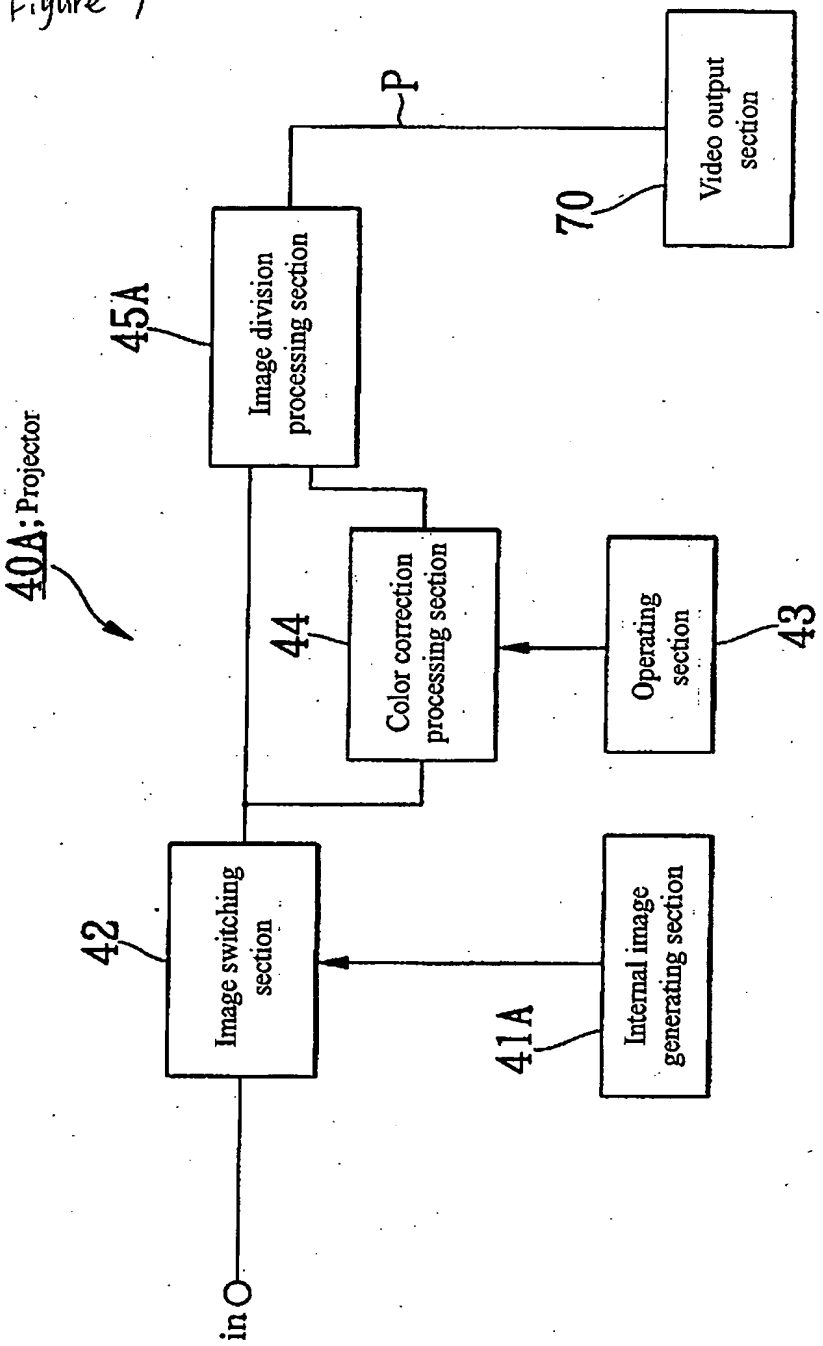
【図５】
Figure 5


Area dividing process
A1
White light projecting process
A2
Corrected image projecting process
A3
Correction data creating process
A4
White adjusting process
A4a
Color balance adjusting process
A4b
Specific color adjusting process
A4c
Color adjusting process
A5

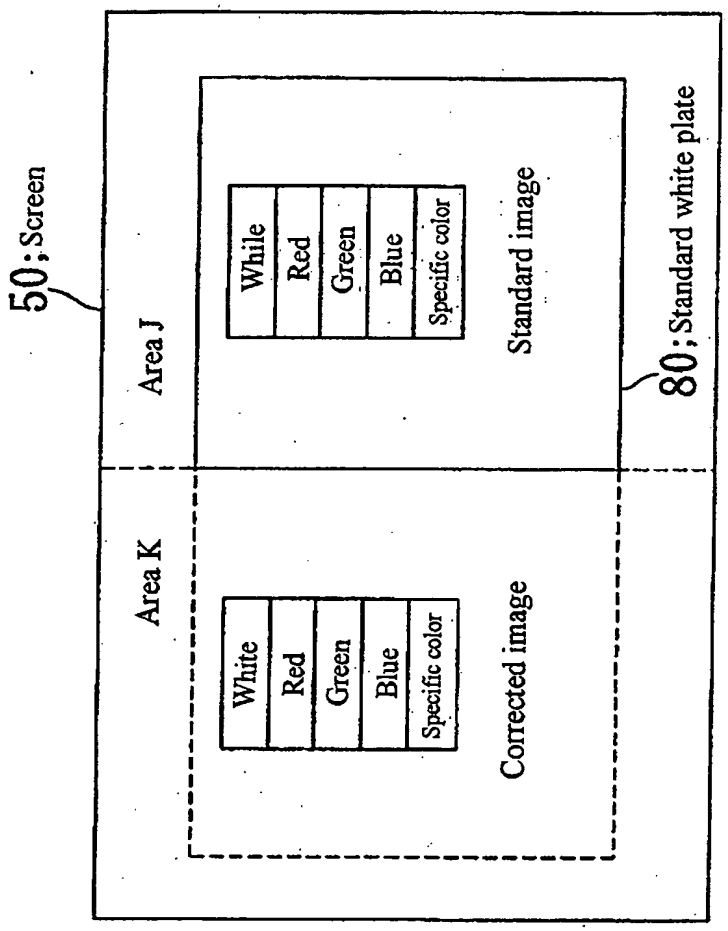
【図６】
Figure 6


80; Standard white plate
R ; Standard image projected area
40A ; Projector
50; Screen
J
K
C; Corrected image projected area

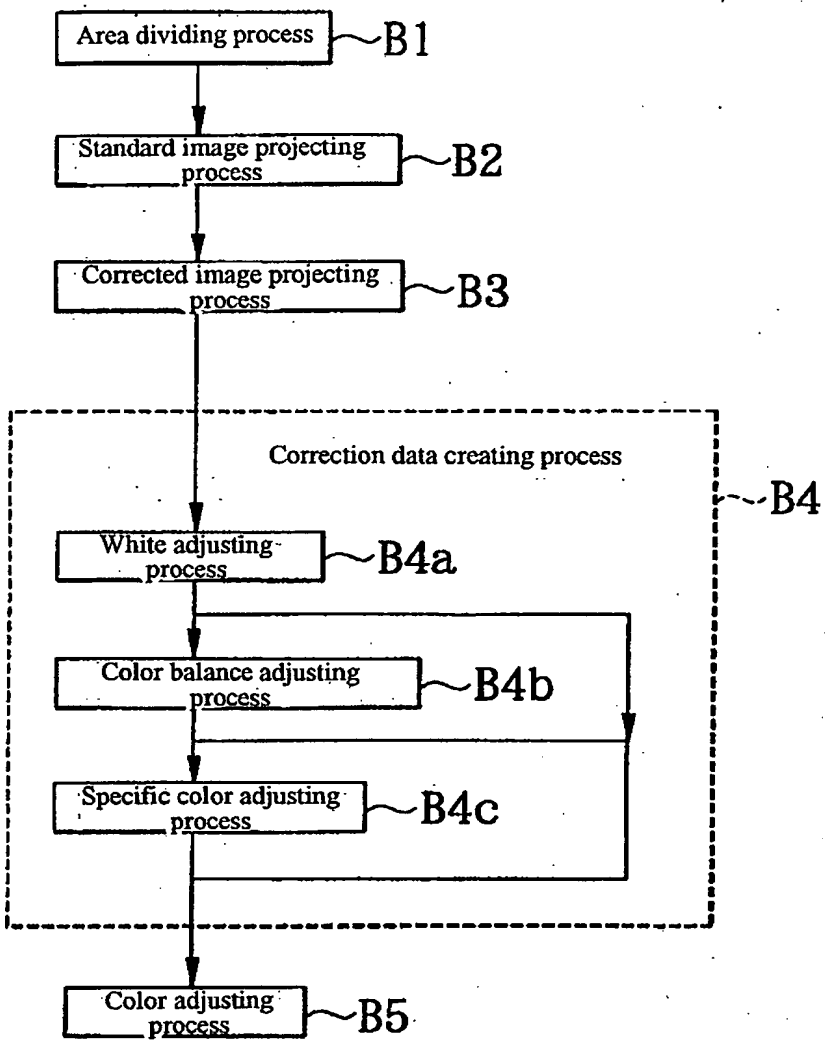
【図７】
Figure 7


40A; Projector
45A
Image division processing section
P
Video output section
70
44
Color correction processing section
Operating section
43
42
Image switching section
41A
Internal image generating section
in

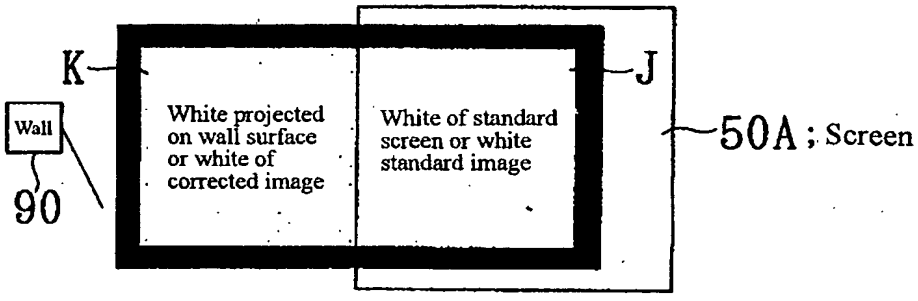
【図８】
Figure 8


50; Screen
Area J
White
Red
Green
Blue
Specific color
Standard image
80; Standard white plate
Area K
White
Red
Green
Blue
Specific color
Corrected image

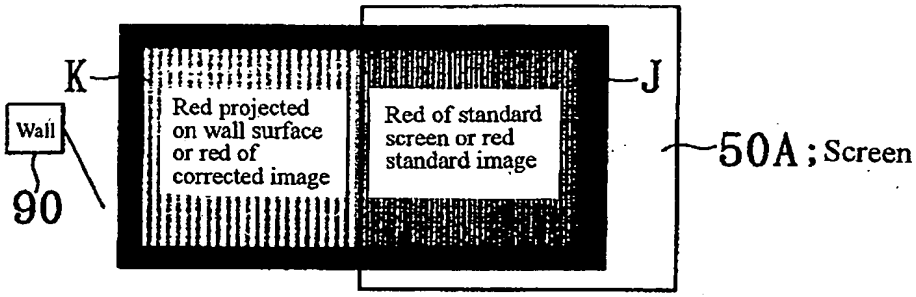
【図９】
Figure 9



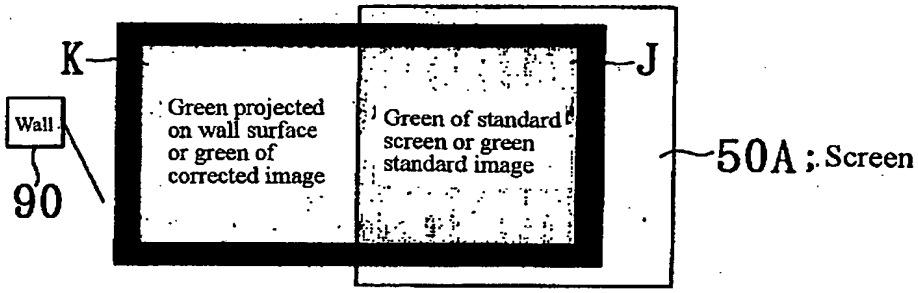
【図１０】Figure 10



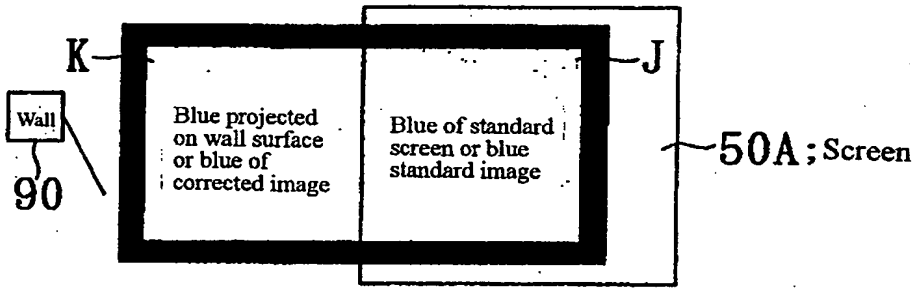
【図１１】Figure 11



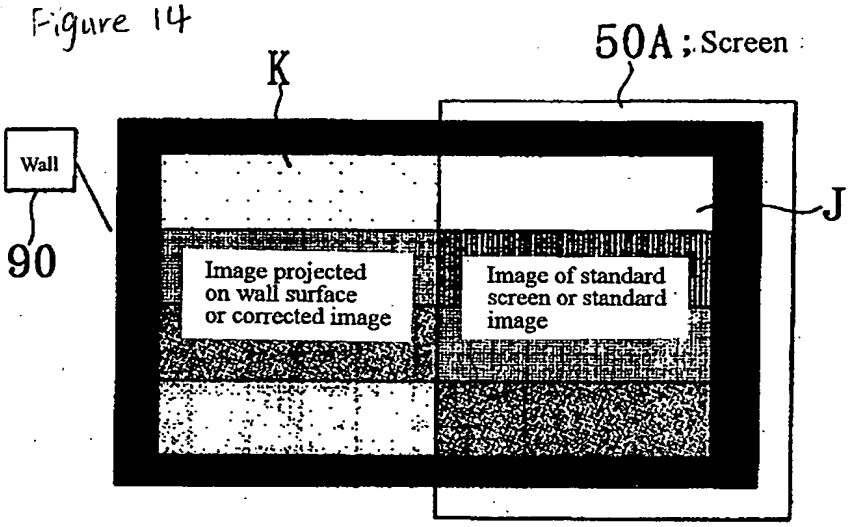
【図１２】



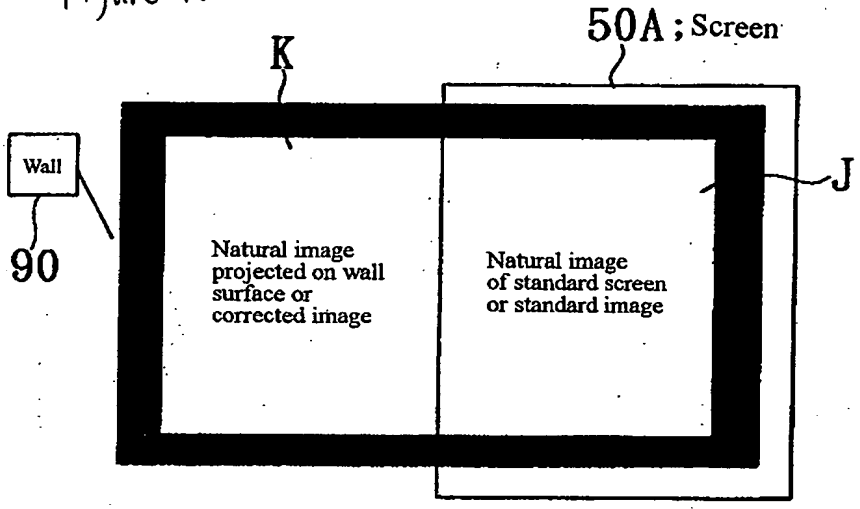
【図１３】



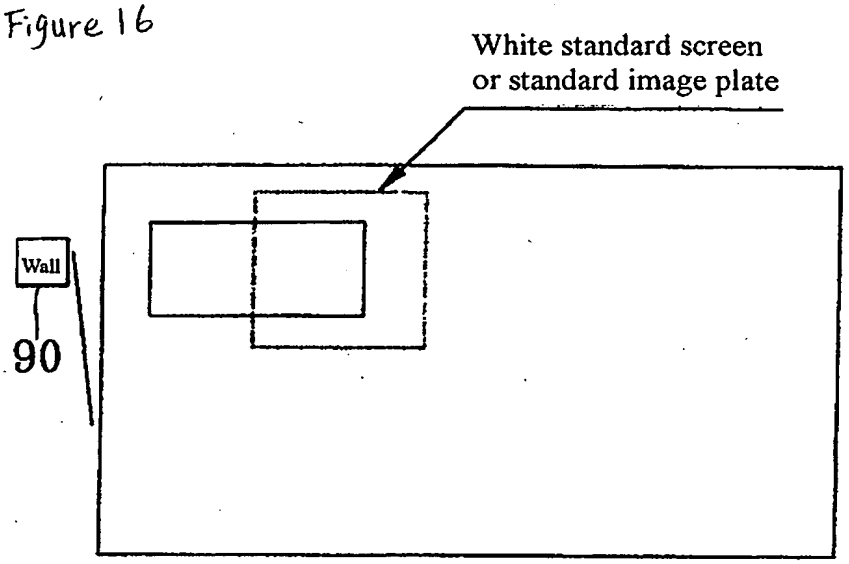
【図１４】
Figure 14



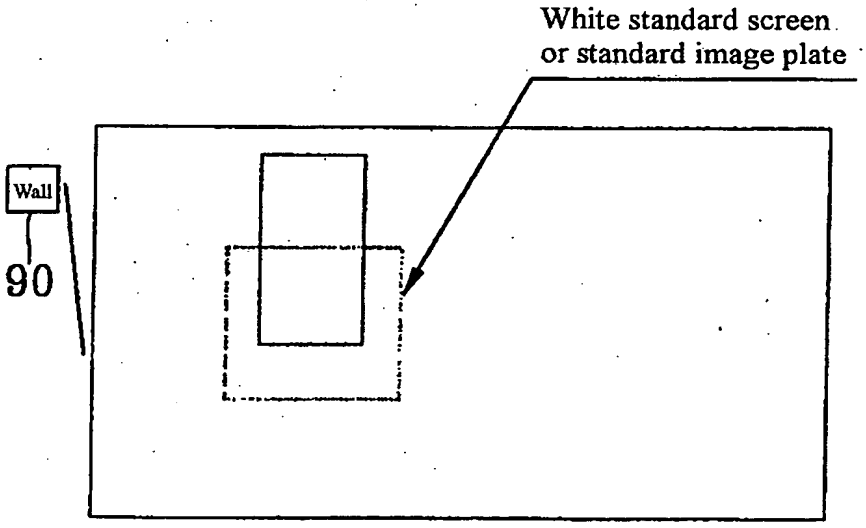
【図１５】
Figure 15



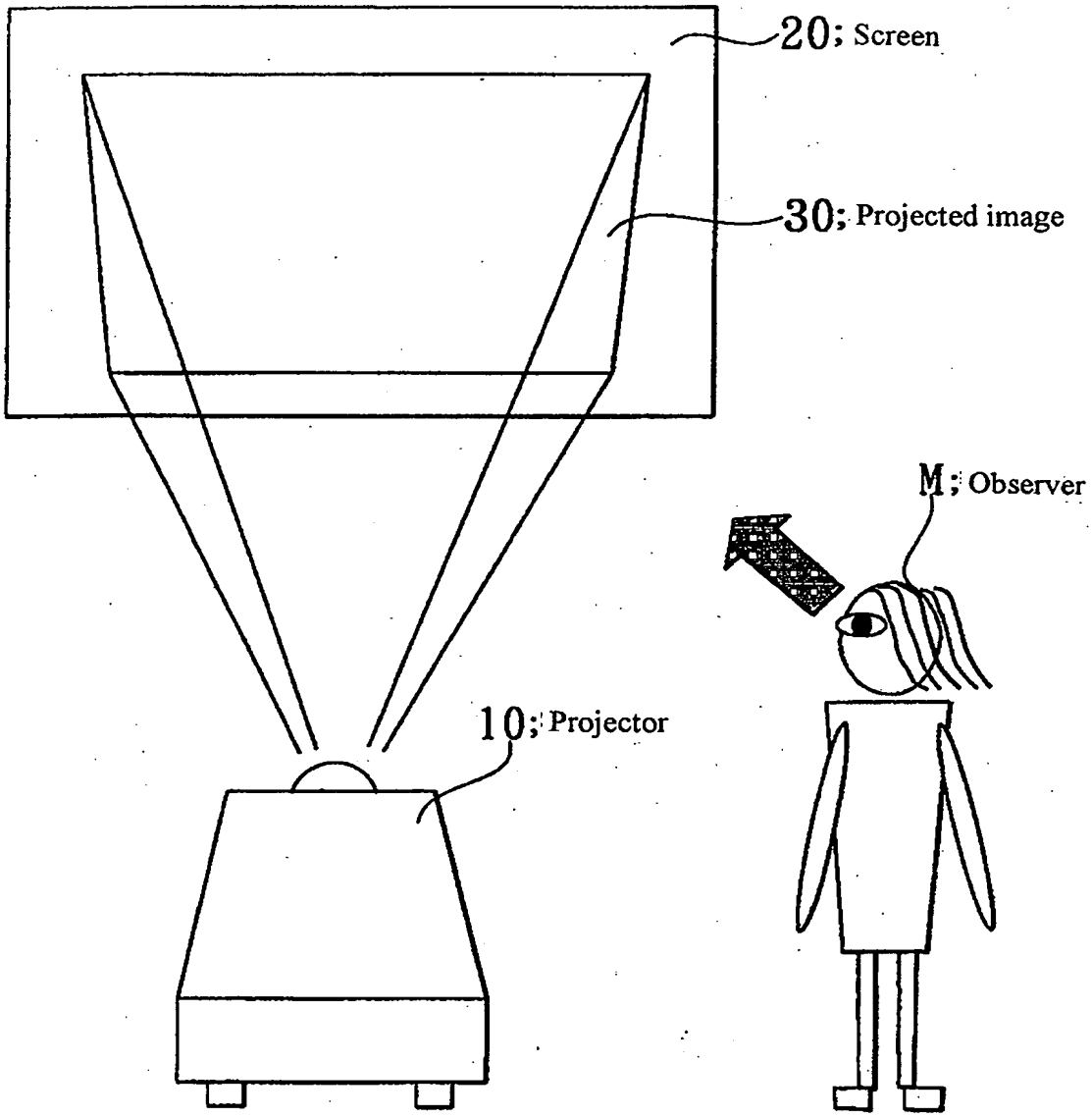
【図１６】
Figure 16



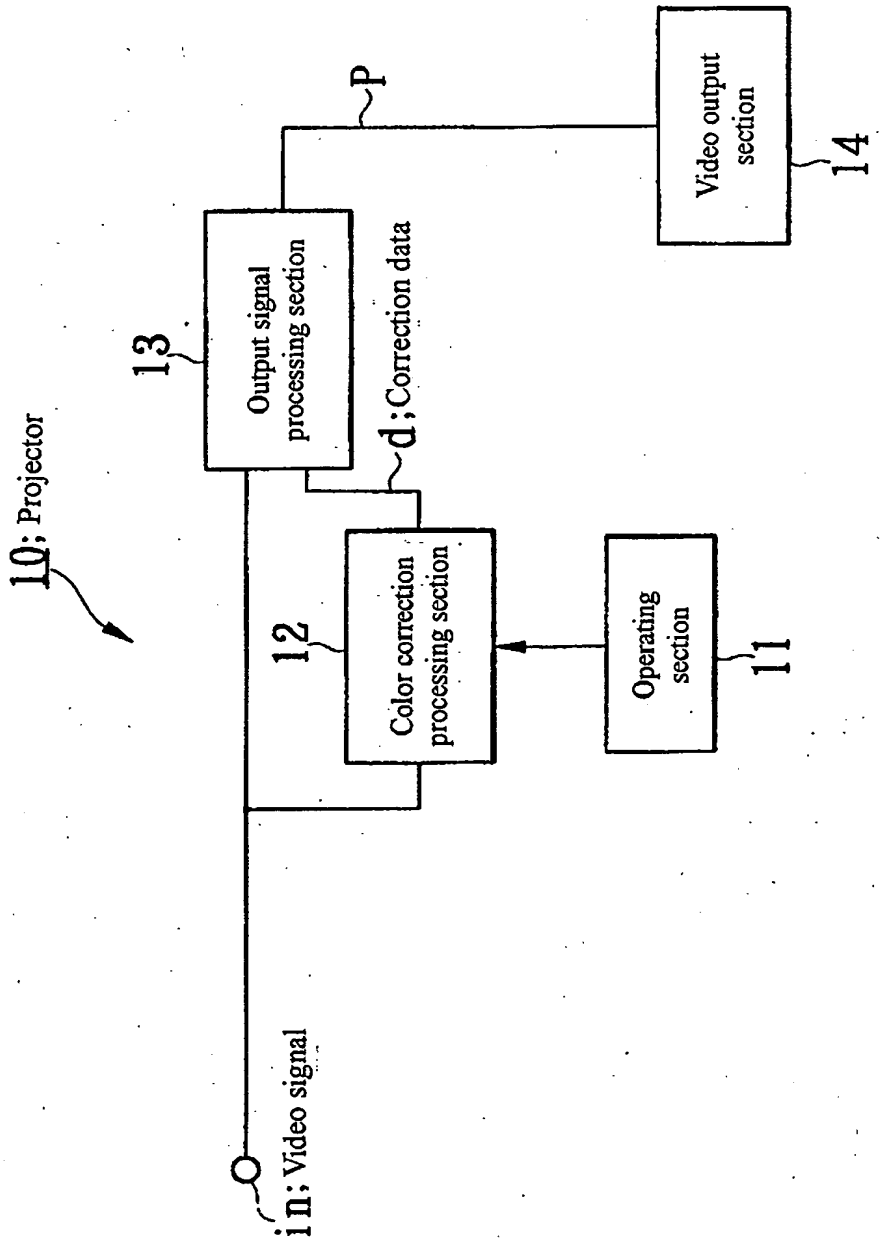
【図１７】
Figure 17



【図１８】
Figure 18



【図１９】
Figure 19



[Title of the Document] Abstract

[Abstract]

[Object]

To provide a color adjusting method used to adjust optimally the color of a projected image if the color of a screen on which the image is projected is different from white.

[Solution]

A display area in a screen 50 is divided in areas J and K. A standard image plate 60 is installed in the area J. Then, white light is projected on the standard image plate 60. A corrected image is projected on the area K, the corrected image having the same pattern as that of a standard image drawn on the standard image plate 60. A white adjusting process comprises paying attention to white parts of the corrected and standard images to make adjustment so that the color of the white part of the corrected image is closer to color of the standard image. A color balance adjusting process comprises paying attention to the color balance of the entire corrected and standard images to make adjustment so that the color balance of the corrected image is closer to that of the standard image. A specific color adjusting process comprises paying attention to a specific color part of each of the corrected and standard images to make adjustment so that the color of the specific color part of the corrected image is closer to that of the standard image.

[Selected Drawing] Figure 4